



A century of change in the Shackleton and West Ice Shelves, East Antarctica

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The collapse of the Larsen A and B ice shelves and retreat of other ice shelves fringing the Antarctic Peninsula raises questions regarding the status of ice shelves in other parts of the Antarctic coastline. Are the large ice shelves along the East Antarctic coast also in danger of permanent collapse, or are they undergoing multi-decadal-scale cycles of expansion and decline? Here we analyse the spatial extent of the Shackleton and West Ice Shelves in East Antarctica to determine the long-term (decadal-century) changes. Data were obtained from early expedition reports, Operation Highjump photos, post-IGY literature, and, from 1963 onwards, satellite imagery.

There has been progressive loss of ice from these two major ice shelves that fringe the Antarctic coastline between 80°E and 105°E. This reduction in extent is part of a long-term trend that has been evident since early in the 20th century. Ice loss has been greatest from the West Ice Shelf, which in 2006 had an area about half that in 1956, and the eastern zone of the Shackleton Ice Shelf, where the once continuous shelf is now in two sections. Further significant calving is anticipated from the West Ice Shelf in the medium term. Loss of ice from the shelves and in grounded icebergs that were present in the past alters the oceanography of the area. Major collapse of the floating ice may result in the disappearance of large polynyas associated with the ice shelves that are important areas for the production of sea ice. The cycles of advance and decline overlaying a generally negative long-term trend in these shelves are similar to that deduced previously for ice shelves further east, and suggests that similar trends are occurring, and therefore similar processes / causes may be acting in a very large sector spanning ninety degrees of longitude, between the Ross Sea and Prydz Bay.